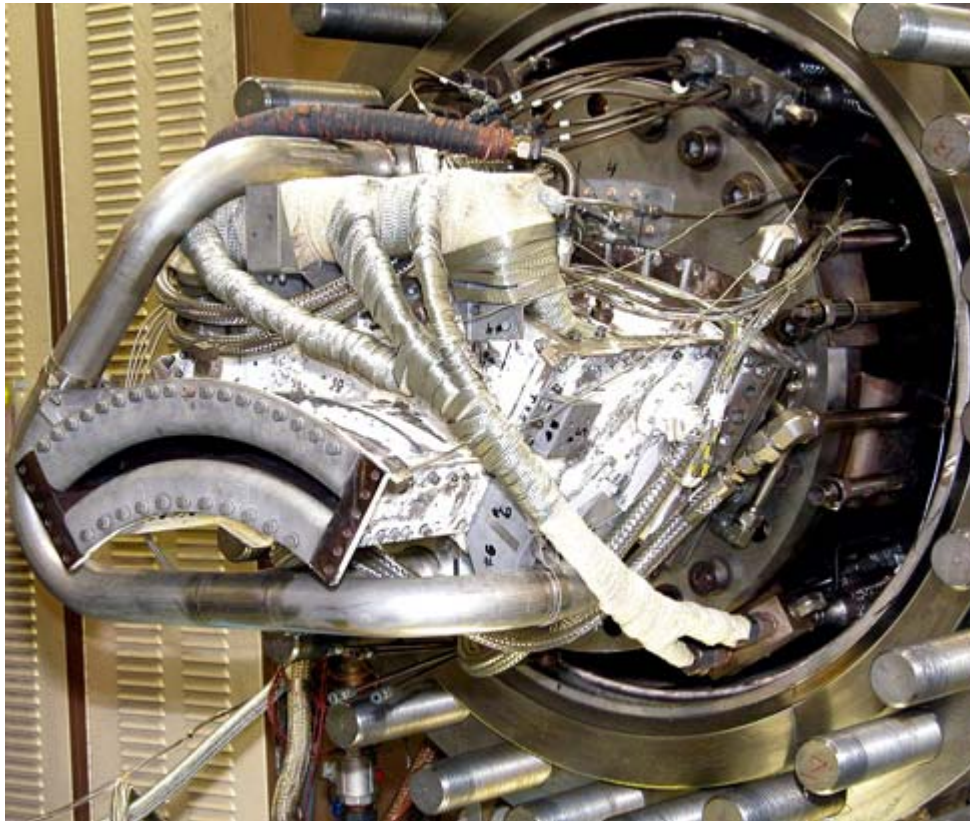


# NASA Glenn's Advanced Subsonic Combustion Rig Supported the Ultra-Efficient Engine Technology Project's Emissions Reduction Test



*General Electric sector combustor mounted in the ASCR.*

The Advanced Subsonic Combustor Rig (ASCR) is NASA Glenn Research Center's unique high-pressure, high-temperature combustor facility supporting the emissions-reduction element of the Ultra-Efficient Engine Technology (UEET) Project. The facility can simulate combustor inlet test conditions up to a pressure of 900 psig and a temperature of 1200 °F (non-vitiated). ASCR completed three sector tests in fiscal year 2003 for General Electric, Pratt & Whitney, and Rolls-Royce North America. This will provide NASA and U.S. engine manufacturers the information necessary to develop future low-emission combustors and will help them to better understand durability and operability at these high pressures and temperatures.

The UEET emissions reduction goal is to demonstrate landing and takeoff nitrogen oxides (NO<sub>x</sub>) emission reductions of at least 70 percent of the 1996 International Civil Aviation Organization limits for future large and regional subsonic engines. This goal

requires the ability to support testing at pressure ratios to 55:1 for large engines and to 30:1 for regional engines. To produce the higher pressures, ASCR has a dedicated high-pressure compressor that pressurizes Glenn's centrally supplied 450-psig combustion air up to 900 psig. The maximum facility airflow is 50 lb/sec, and the maximum combustor exhaust gas temperature is 3400 °F. These unique capabilities provide combustor test simulations at up to 60 atm, twice the capability of other combustor rigs in the United States.

In fiscal year 2003, ASCR completed three sector tests for aircraft engine companies evaluating combustor concepts for achieving UEET's 70-percent NO<sub>x</sub> emissions-reduction goals. The success of these tests will help these companies develop technologies that can eventually be tested in a full annular combustor as part of UEET's longer-term project goals starting in fiscal year 2004. ASCR was instrumental in providing the high-pressure, high-temperature simulated engine test conditions necessary to provide NASA and U.S. engine manufacturers with the ability to quantify the effects of higher pressure on combustor emissions, durability, and operability.

**Find out more about this research:**

**Research facilities at Glenn** at <http://facilities.grc.nasa.gov/>

**Aeronautics research at Glenn** at <http://www.grc.nasa.gov/WWW/AERO/>

**Glenn contact:** Luis R. Beltran, 216-433-5678, [Luis.R.Beltran@nasa.gov](mailto:Luis.R.Beltran@nasa.gov)

**QSS Group, Inc., contact:** Susan E. Adkins, 216-433-5930,  
[Susan.E.Adkins@grc.nasa.gov](mailto:Susan.E.Adkins@grc.nasa.gov)

**Author:** Luis R. Beltran

**Headquarters program office:** OAT

**Programs/Projects:** UEET